Welfare and Teardown Selection Appendix to "From Today's City to Tomorrow's City: An Empirical Investigation of Urban Land Assembly"

Expanded Discussion of Welfare Implications and Teardown Selection Issues

NOT FOR PUBLICATION

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November 2015

1 Welfare Implications

This appendix considers the impact of the land assembly frictions we document on overall welfare. Our evidence suggests that there is a substantial deadweight loss associated with the inability of the private market to produce the market clearing quantity of assemblies—the grey area in Figure 1b. Given the magnitude of the surplus to assembly we document, this deadweight loss is likely to be large. The effect on overall welfare could be mitigated, however, if land assembly produces negative externalities; in this case any decrease in deadweight loss from additional land assembly could be outweighed by the negative externalities of assembly.

Before detailing our strategy for estimating the external effects of assembly, we acknowledge that assessing the welfare consequences of the frictions inhibiting land assembly is far from straightforward. Most models of urban structure assume some form of externality or market failure in cities that generates agglomeration or congestion. The existence of an urban externality means that the equilibrium allocation of residents and economic activity is not optimal. As in any second best setting, removing a specific market failure, such land assembly frictions, need not increase welfare. For instance, Helpman (2007) demonstrates that reducing transportation costs can reduce the concentration of economic activity and, in the presence of agglomerative externalities, lower welfare. Similarly, Kanemoto (2013) shows that a transportation improvement in a particular city can reduce welfare if there are alternative cities with larger agglomeration economies. Therefore, reducing land assembly frictions might lessen the deadweight loss, but could simultaneously introduce or intensify negative externalities (or reduce existing positive externalities).

With this caveat in mind, we analyze the external effects of land assembly. We divide these external effects into two groups: local and non-local (i.e. MSA-wide). Beginning with the local externalities, assembly may provide positive amenities such as restaurants and retail outlets. It may also negatively influence the neighborhood by blocking sunlight, altering neighborhood "character," or congesting local public goods including parks, schools and on-street parking. It is certainly the case that opposition to the type of dense projects built on assembled land is often very localized in nature. The net local external value of assembly should capitalize into the value of the parcels near the assembly. Examining this capitalization therefore provides insight into the effect of assembly on non-assembly properties.

To estimate these local externalities, we use a specification very similar to equation (3). We replace $1\{\textit{pre-assembly very close neighbor}\}_i$ with $1\{\textit{assembly very close neighbor}\}_i *$ $1\{\textit{post assembly}\}_t$ — an indicator for being on the same mapbook page as an assembly interacted with an indicator for t being equal to or greater than the year in which the assembly started. The sample is all non-assembly and non-teardown sales. Intuitively, this specification asks whether parcels very close to the assembly experience a price change after the assembly.

The estimates in Welfare Appendix Table 1 column (1) suggest that assembly increases the value of nearby properties, but the magnitude is small and only marginally precise. The estimate becomes imprecise when we include controls for capital in column (2). In column (3), we restrict the sample to single family homes. The point estimate is diminishingly small and estimated with enough precision to rule out even small spillovers: the boundaries of the 95th percentile confidence interval are -0.015 and 0.022.

The remaining columns restrict the sample to non-residential properties. Column (4) suggests that assembly increases the value of nearby non-residential properties by around 12 percent. To examine whether this spillover varies with time, in column (5) we allow the effect to vary by whether the sale occurred within three years of the start of the assembly or more than 3 years after. To more firmly establish causality, we also include a variable for assembly sales 1 to 3 years *before* the assembly. If the spillovers are caused by the assembly, as opposed to merely correlated with them, they should not emerge until the assembly has started. (The inclusion of the pre-assembly variable is extremely similar in spirit to the falsification check of Table 3.) The estimate in column (5) for the pre-assembly period is small, around 3 percent, and quite imprecise. It therefore supports a causal interpretation of the non-residential spillover result. The post-assembly effect is roughly 12 percent and holds constant over time. Column (6) includes tract-year terms and yields similar results. Thus, we find no evidence that assembly generates negative local externalities that might counterbalance the deadweight loss from our main results. Instead, we find evidence of positive spillovers onto neighboring non-residential properties that amplify the deadweight loss implied by our primary results.

We lack evidence on the non-local externalities, or those which operate at a more expansive geographic level than the very close neighbors of an assembly. Although we can only speculate, assembly may have substantial positive spillovers at the metropolitan level. For instance, through promotion of greater density, assembly may promote agglomerative externalities. Assembly may replace development at the urban fringe with development in areas with access to public transportation, thereby reducing overall traffic congestion. It may also confer benefits on some local governments through increased tax revenue. Of course, there may be negative spillovers as well. If assembly increases the population of a metro area, congestion during commuting hours may worsen. All we can say with certainty is that the net effect of spillovers operating beyond the immediate vicinity of assemblies would need to be negative and quite large to offset both the direct deadweight loss and the local, positive spillovers onto non-residential property.

Overall, we construe this evidence as pointing toward the possibility, but not the certainty, of large and negative welfare effects arising from frictions in the market for assembly.

2 Teardown Selection Issues

Our approach departs from the teardown literature in one important regard. The teardown literature controls for selection into redevelopment using a Heckman two-stage procedure. Accordingly, coefficient estimates yield marginal effects for the untruncated, latent dependent variable. When the goal is to recover the value of all land, whether redeveloped or not, this is an appropriate approach. Because our aim differs, we estimate equation (2) using OLS. Two points bear emphasis. First, the OLS coefficients recover marginal effects for the truncated, observed dependent variable. These effects are precisely those required for the primary test. Specifically, the OLS estimate of α_1 answers the question: among redeveloped parcels (i.e., in the observed portion of the distribution), is there excess value to assembly? The arbitrage argument underlying the test is only valid for parcels actually undergoing redevelopment. Arbitrage should not eliminate the surplus to assembly for parcels whose condition makes redevelopment suboptimal (e.g., those containing capital too valuable for redevelopment). Second, although the conditional expectation function is non-linear, OLS provides a well-defined minimum mean squared error linear approximation. Angrist and Pischke (2009, page 102-3) and Cameron and Travedi (2005, page 542) discuss using OLS to fit the conditional expectation function of a left-truncated distribution.

References

Angrist, Joshua and Pischke, Jorn-Steffen, 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

Cameron, A. Colin and Travedi, Pravin K., 2005. *Microeconometrics: Methods and Applications*. Cambridge: Cambridge University Press.

Helpman, Elhanan, 2007. "The Size of Regions." In David Pines, Efraim Sadka, and Itzhak Zilcha, (Eds.) "Topics in Public Economics: Theoretical and Applied Analysis," Cambridge University Press.

Kanemoto, Yoshitsugu, 2013. "Second-best costbenefit analysis in monopolistic competition models of urban agglomeration." *Journal of Urban Economics* 76: 83–92.

Welfare Appendix Table 1: Do Assemblies Spill Over Onto Neighboring Parcels?

	Full Sample		Single Family	Non-Residential		
	(1)	(2)	(3)	(4)	(5)	(6)
1{Assembly Neighbor}* 1{Post Assembly}	0.038+	0.033	0.004	0.118*		
	(0.021)	0.023)	(0.009)	(0.048)		
1{Assembly Neighbor} * 1{1 to 3 Years Prior to Assembly}					0.034	0.036
					(0.048)	(0.063)
1{Assembly Neighbor} * 1{1 to 3 Years Post Assembly}					0.127*	0.112
					(0.064)	(0.090)
1{Assembly Neighbor} * 1{More than 3 Years Post Assembly}					0.112*	0.150*
					(0.052)	(0.065)
Observations	1,245,050	1,268,536	788,875	126,283	126,283	126,283
Geographic Fixed Effects						
Tract	x					
Block Group		x	x	x	x	
Tract-Year						x
Additional Covariates						
Year*Quarter of Sale	x	x	x	x	x	x
Year-Quarter of Sale * Non-Res.	x	x				
Use Classification	x	x				
Cubic in Lot Size	x	x	x	x	x	x
Distance to Amenities	x					
Neighborhood Demographics	x					
Capital Controls		x	x	x	x	x
Capital Controls * Non-residential		x				

Sources: See Data Appendix for complete information.
Notes: The dependent variable in these regressions is log(real sales price per square foot). 1{Assembly Neighbor} equals one for parcels on the same mapbook page as an assembly. 1{Post Assembly} equals one in the year of the assembly and in all subsequent years. The sample is sales on all parcels save teardowns and assemblies between 1999 and 2011. Standard errors clustered at the city level are given in parentheses. Significance levels are denoted by *** for significant at the 0.1% level, ** for significant at the 1% level, * for significant at the 5% level, and + for significant at the 10% level. Use classifications, amenities and demographics as given in the note on Table 2. The capital controls include the value of improvements to the land per square feet, the ratio of the value of improvements to the land to the value of the land (i.e. capital to land ratio) and a full set of interactions of indicators for decile of structure age with indicators for decile of structure square feet divided by lot square feet (for both deciles an 11th indicator variable is added to denote missing values).